IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

ALIGN TECHNOLOGY, INC., Plaintiff and Counterclaim Defendant, v. 3SHAPE A/S and 3SHAPE TRIOS A/S Defendants and Counterclaimants.	C.A. No. 6:20-cv-00979-ADA **JURY TRIAL DEMANDED**

ALIGN TECHNOLOGY INC.'S OPENING CLAIM CONSTRUCTION BRIEF

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INTRODUCTION

Align respectfully submits its opening claim construction brief regarding 3Shape's asserted patents. The parties have claim construction disputes regarding nine terms from the following 3Shape patents: U.S. Patent Nos. 10,097,815 ("the '815 patent"), 10,383,711 ("the '711 patent"), and 10,905,333 ("the '333 patent").[1]

The '815 patent claims a 3D scanner with a processor for comparing scanner images against a reference. There is one disputed claim term in this patent, where 3Shape improperly attempts to avoid a construction of a term that the specification itself explicitly defines.

The '711 patent claims systems and methods for obtaining 3D scans with color and geometry information. There are five disputed claim terms in the '711 patent. Two of the disputed terms in the '711 patent are indefinite because they lack a reasonably certain meaning or use terms of degree for which a person of skill in the art cannot make an informed or confident choice among the competing definitions. For the remaining three disputed claim terms, 3Shape's proposed constructions fail to faithfully apply and give meaning to the claim language. For example, 3Shape's proposed construction of "multichromatic probe light" relies on a technically inaccurate definition of "multichromatic" that is not supported by the '711 patent's specification.

The '333 patent relates to a 3D scanner that uses fluorescent light to detect regions of the teeth that have tooth decay and combines that with a digital 3D picture of the teeth. Three claim terms from the '333 patent are in dispute. In each, Align has construed those claim terms as informed by the specification and its discussion of what constitutes the invention. And in a third, 3Shape seeks to avoid the clear meaning of the claim language that two references to light at a "second wavelength" are to the same wavelength.

[1] The Asserted Patents with disputed constructions are attached as Ex. 1 ('815 patent), Ex. 2, ('711 patent), and Ex. 3 ('333 patent), and will be referred to herein by patent number.

ARGUMENT

I. U.S. PATENT NO. 10,097,815

The '815 patent is entitled "Focus scanning apparatus" and claims a scanner for determining the 3D geometry of all or part of an object. The scanner includes a processor that compares the light from the images being taken against a reference image as part of the scan itself. There is a single term in dispute.

A. "correlation measure" (asserted claims 33, 40)

Align's Proposed Construction	3Shape's Proposed Construction
"a measure of the degree of correlation between (1) a signal derived from the pattern, and (2) light input signal or sensor input signal from the sensors in the camera"	Plain and ordinary meaning

Independent claim 33 refers to a processor that generates "a correlation measure." The parties' dispute is narrow. The '815 patent defines "correlation measure" and associated terms in the "Definitions" section of the specification. Align believes that express definition is controlling. 3Shape argues instead that the term has a "plain and ordinary meaning" that could be different from the definition the inventors provided. But 3Shape acted as its own lexicographer when it obtained the patent, and it cannot disregard that definition now.

Creating high resolution 3D images generates "an enormous amount of data," much of it in the form of images. ('815 patent at 8:56–57.) That data must travel from the scanner capturing the images to a display that allows the dental practitioner to view what has been scanned in "real time." (*Id.*) The more data sent from the scanner to a display or work station, the slower the scanning process can become, especially if the data is out of focus or is otherwise of lower quality. To address this issue, the '815 patent describes a way for the scanner to analyze the pictures it is taking before the data is sent on. It does that by comparing the captured image (or input signal) against a reference

(or reference signal) and measuring their correlation. For example, understanding the relationship between the input signal and the reference signal allows the "camera electronics to discriminate out-of-focus [*i.e.*, unusable] information." (*Id.* at 8:60–65.)

To do so, the patent claims the use of a "correlation measure." The specification defines "correlation measure" and its components in the "Definitions" section as follows:

> Correlation measure: A measure of the degree of correlation between a reference and input signal. . . .
>
> Input signal: Light input signal or sensor input signal from the sensors in the camera. . . .
>
> Reference signal: A signal derived from the pattern. . . .

('815 patent at 5:57–58, 5:62–63, 5:65–66.) Align's proposed construction combines the definitions the inventors set forth in the patent, inserting the definitions for "input signal" and "reference signal" into the definition for "correlation measure."

3Shape acted as its own lexicographer in defining "correlation measure," and the Court should give effect to "this lexicographic choice." *Biogen MA Inc. v. EMD Serono, Inc.*, 976 F.3d 1326, 1336 (Fed. Cir. 2020). Indeed, a definition provided by the patentee in the specification itself "is the single best guide to the meaning of a disputed term." *Jack Guttman, Inc. v. Kopykake Enters., Inc.*, 302 F.3d 1352, 1360 (Fed. Cir. 2002) (citation omitted) (reversing district court's claim construction that departed from definition in specification).

3Shape's intent to define the term is obvious from its inclusion of the term in a tailormade "Definitions" section of the specification. *AstraZeneca LP v. Apotex, Inc.*, 633 F.3d 1042, 1051 (Fed. Cir. 2010) (finding lexicography even when "[t]he specification [did] not reveal such a definition explicitly"); *Allergan, Inc. v. Apotex Inc.*, 754 F.3d 952, 957 (Fed. Cir. 2014). 3Shape cannot now advance some different meaning of "correlation measure"—whether described as plain, ordinary, or otherwise. *Jack Guttman, Inc.*, 302 F.3d at 1360 ("It is black letter law that a patentee can 'choose to

be his or her own lexicographer by clearly setting forth an explicit definition for a claim term that could differ in scope from that which would be afforded by its ordinary meaning.'") (citation omitted).

The claims are consistent with the specification's definitions. Claim 33 recites that the "correlation measure" is generated "at least partly by comparing a *reference signal* representing the probe light incorporating the spatial pattern with an *input signal* representing the light returned from the object to the camera." ('815 patent at 39:61–40:3 (emphasis added).) The "reference signal" incorporates a "spatial pattern," *i.e.*, it is a "a signal derived from the pattern." Likewise, an "input signal" represents "the light returned from the object to the camera," *i.e.*, the "[l]ight input signal or sensor input signal from the sensors in the camera." ('815 patent at 5:57–58.)

By expressly defining "correlation measure" in the specification, 3Shape cannot now argue that there is a different "plain and ordinary" meaning that should apply. "[T]he place to [define terms] is in the specification of the inventor's application, and the time to do so is prior to that application acquiring its own independent life as a technical disclosure through its issuance as a United States patent." *Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 889 (Fed. Cir. 1984). The Court should give effect to these definitions and adopt Align's construction.

II. U.S. PATENT NO. 10,383,711

The '711 patent is entitled "Focus Scanning Apparatus Recording Color." It refers primarily to a scanner system and method for recording three-dimensional surface information and color information for an object using at least partly the same 2D image as recorded by a color image sensor. Five claim terms are in dispute.

A. "multichromatic probe light for illumination of the object" (asserted claim 1)[2]

Align's Proposed Construction	3Shape's Proposed Construction
Plain and ordinary meaning, which is "a probe light with more than one wavelength that illuminates the object"	Plain and ordinary meaning, which is "light having more than one color at the same time, that strikes the object."

Claim 1 of the '711 patent includes "a multichromatic probe light for illumination of the object[.]" Align proposes a straightforward construction of this claim that construes "multichromatic" as requiring—according to its technical definition—"more than one wavelength" and otherwise utilizes the easily understood plain language of the limitation. 3Shape, in contrast, proposes an overly restrictive view of the claim term, seeking to import unwarranted limitations by requiring (1) more than one color (as opposed to more than one wavelength), (2) that the colors occur "at the same time," and (3) that the probe light "strike[] the object." Align's proposed construction should be adopted.

Align's construction—which simply requires that monochromatic light have "more than one wavelength"—accurately and succinctly describes how a person of ordinary skill would understand this claim term. (Ex. 4, Hesselink Decl. ¶ 26.) The remainder of the claim language is straightforward. A person of skill in the art needs no further construction to understand what a "probe light" is, particularly in light of the remainder of the claim limitation describing the "multichromatic light source" that generates the probe light. Nor is any construction of "illuminates the object" required. The plain English claim language is easily understood to cover a light that shines onto an object.

Whereas Align's construction concisely provides the meaning of the probe-light term, 3Shape's construction improperly imports various limitations into the claim language. The issues with 3Shape's construction are threefold. First, 3Shape's requirement that the probe light must be a

[2] This claim term was proposed by 3Shape. The other eight terms are proposed by Align.

"light having more than one color" is inconsistent with how a person of ordinary skill in the art would understand that term. (*Id.* ¶¶ 28–29.) Wavelengths constitute a physical property of light, while color connotes the perception or sensation that light imparts on the human eye. (*Id.* ¶ 29.) A person of skill would understand a monochromatic probe light in terms of its physical properties—one or more wavelengths—not the way a human eye perceives it—its color. (*Id.*) Defining a multichromatic light in terms of its wavelengths is also more accurate. A "multichromatic probe light" could be made up of different shades of the same color light, *i.e.*, two different green lights. (*Id.* ¶ 28.); *See Only The First, Ltd. v. Seiko Epson Corp.*, No. 07-cv-1333, 2009 WL 1956930, at *10 (N.D. Ill. July 8, 2009) ("[B]ecause the spectrum is a continuum, there are no clear boundaries between the colors, and the same color can be described using different wavelength ranges.").

Second, 3Shape is apparently construing "for illumination of the object" as a light that "strik[es] the object." This is unnecessary. The term "illumination" is a widely accepted and easily understood term in the field of optics and needs no further definition. (Ex. 4, Hesselink Decl. ¶ 30.) In contrast, the term "strike" has no commonly accepted meaning to a person skilled in the art. (*Id.*)

Finally, 3Shape's requirement that the colors need to occur "at the same time" is overly narrow and technically incorrect. It is not necessarily the case that the different wavelengths of light need to be emitted at the same time. (*Id.* ¶ 31.) As described in one embodiment of the '711 patent, the multichromatic light source could be a multi-die LED light source that "illuminat[es] [the object] with only a subset of the LED dies in the multi-die LED." ('711 patent at 13:56–58.) In that case, the lights could be used independently—and non-simultaneously—to illuminate the object. (Ex. 4, Hesselink Decl. ¶ 31.)

The Court should adopt Align's construction of a "multichromatic probe light for illumination of the object," which is more faithful to the patent language and supported by the intrinsic and extrinsic evidence.

B. "image pixels" / "image sensor pixels" (asserted claim 1)

Align's Proposed Construction	3Shape's Proposed Construction
Indefinite; if not found indefinite: - "image pixels": "pixels on the image that are derived from the image sensor pixels" - "image sensor pixels": "pixels on the image sensor"	Not indefinite; "pixels on the image sensor"

Claim 1 of the '711 patent refers to both "image pixels" and "image sensor pixels." 3Shape contends these two different terms should be given the exact same construction—"pixels on the image sensor." But the intrinsic and extrinsic evidence demonstrate that these two different terms would be understood by a person of skill in the art to have distinct meanings. Once those distinct meanings are considered, claim 1 is rendered indefinite because it fails to inform a person of ordinary skill about the scope of the claimed invention.

A claim is invalid for indefiniteness if its language, when read in light of the specification and the prosecution history, "fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014). A claim is indefinite if it can be read to mean different things, and "no informed and confident choice is available among the competing definitions." *Id.* at 911 n.8; *see also Media Rights Techs., Inc. v. Capital One Fin. Corp.*, 800 F.3d 1366, 1371 (Fed. Cir. 2015); *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014). Another circumstance in which claims are indefinite is where the claims and their terms, as properly construed, are nonsensical. *See Trs. of Columbia Univ. v. Symantec Corp.*, 811 F.3d 1359, 1366–67 (Fed. Cir. 2016) (holding claims describing the extraction of machine code instructions from something that did not have machine code instructions indefinite as "nonsensical in the way a claim to extracting orange juice from apples would be").

The relevant portions of claim 1 of the '711 patent that use the phrases "image pixels" and "image sensor pixels" are:

> a data processing system configured to derive surface geometry information for a first set of ***image pixels*** within a block of the ***image sensor pixels*** …
>
> the data processing system further configured to derive surface color information for a second set of ***image pixels*** within the block of the ***image sensor pixels*** …

('711 patent at 19:53–59.) The phrase "image pixel(s)" is used only twice in the patent's specification (outside of the two uses of the phrase in claim 1)[3]:

> The scanner system may comprise means for evaluating a correlation measure at each focus plane position between at least one ***image pixel*** and a weight function.

(*Id.* at 5:59–61 (emphasis added).)

> FIGS. 2A-2B show a section of a prior art pattern generating element 130 that is applied as a static pattern in a spatial correlation embodiment of WO2010145669, as imaged on a monochromatic image sensor 180. The pattern can be a chrome-on-glass pattern. The section shows only a portion of the pattern is shown [sic], namely one period. This period is represented by a pixel block of 6 by 6 ***image pixels***, and 2 by 2 pattern fields.

(*Id.* at 17:5–12 (emphasis added).) In contrast, the phrase "image sensor pixels" is used throughout the patent. (*See e.g., id.* at 2:62–3:6, 4:16–19, 5:44–48 (reciting the phrase "image sensor pixels").)

A person of ordinary skill in the art would not, as 3Shape contends, understand "image pixels" and "image sensor pixels" to both refer to "pixels on the image sensor." While that may be a fair construction of "image sensor pixels," a person of skill in the art would attribute a different meaning to "image pixels." (Ex. 4, Hesselink Decl. ¶ 38); *see also CAE Screenplates Inc. v. Heinrich Fiedler GmbH & Co. KG,* 224 F.3d 1308, 1317 (Fed. Cir. 2000) ("In the absence of any evidence to the contrary, we must presume that the use of these different terms in the claims connotes different meanings."). A person of ordinary skill in the art would understand that term to refer to the pixels on an image (as opposed to on a sensor) that are *derived from* the pixels on the image sensor. (Ex. 4,

[3] Notably, the phrase "image pixels" was added to claim 1 as part of an amendment during prosecution of the '711 patent, but 3Shape's amendment did not identify the "image pixel" term as new claim language. (*Compare* Ex. 5, '711 Application dated February 25, 2018 at 41, *with* Ex. 6, Preliminary Amendment dated June 11, 2018 at 2.)

Hesselink Decl. ¶ 38.) The person of ordinary skill would understand "image sensor pixels," in contrast, to refer to an element of the sensor—specifically its pixels. (*Id.*) Put another way, an "image pixel" is a picture element that represents the picture's intensity and color information—the data related to a pixel of the image—whereas an "image sensor pixel" is a physical element on the detector (or sensor). (*Id.*)

Application of those constructions of "image pixels" and "image sensor pixels" renders the claim indefinite because it would mean that, according to claim 1: "a first set of image pixels," *i.e.*, pixels *on the image* that are derived from the image sensor pixels, are "within a block of the image sensor pixels," *i.e.*, pixels *on the image sensor*. Because the "image pixels" are an element of the image, and the "image sensor pixels" are an element of the sensor or detector, a person of skill in the art would not be able to grasp or understand what it means for a "set of image pixels" to be "within a block of the image sensor pixels." (*Id.* ¶ 39.) In other words, claim 1 is indefinite because the claim's use of two distinct phrases ("image pixels" and "image sensor pixels") renders the claim unintelligible "in the way a claim to extracting orange juice from apples would be[.]" *Trs. of Columbia Univ.*, 811 F.3d at 1367.

3Shape apparently recognizes this issue and attempts to resolve it by construing the two terms—"image pixels" and "image sensor pixels"—identically, effectively seeking to transform the claim language from extracting orange juice from apples to extracting apple juice from apples. But 3Shape's construction does not reflect how a person of skill in the art would understand those two distinct terms. (Ex. 4, Hesselink Decl. ¶ 41.) As noted above, the specification uses the two distinct terms differently. In the case of "image sensor pixels," the inventor is referring to physical elements (the detector elements of the sensor), whereas an "image pixel" refers to data (the measure of light intensity and color *made* by the image sensor pixels that give rise to a digitized or pixelated image representation of the incoming light field). (*Id.* ¶ 42.)

The intrinsic evidence supports this distinction. First, as quoted above, in its discussion about deriving surface geometry the patent describes an embodiment with "means for evaluating a correlation measure at each focus plane position between at least one ***image pixel*** and a weight function[.]" ('711 patent at 5:59–63 (emphasis added).) That reference is to data that results from the measure of light intensity and color as detected by the image sensor pixel. (Ex. 4, Hesselink Decl. ¶ 43.) The distinction is further illustrated by the sentence immediately preceding, which describes "the 2D image *captured* by said block of image sensor pixels." ('711 patent at 5:53–54.)

In another example, also noted above, the patent uses the phrase "image pixels" to describe Figure 2B, which illustrates the measure of light intensity generated by the image sensor pixels. ('711 patent at 17:5–28; Ex. 4, Hesselink Decl. ¶ 44.) In contrast, Figure 2A represents the pixels on the image sensor ("image sensor pixels") before they have measured the intensity of light. (Ex. 4, Hesselink Decl. ¶ 44.)

Finally, a foreign patent publication that is incorporated by reference in the specification of the '711 patent supports Align's proposed constructions, and resulting indefiniteness of these terms. WO 2010/145669 A1 ("Fisker"), which the '711 patent cites as providing the "prior art pattern generating element," refers "image pixels" and uses the same meaning to the phrase as Align proposes here. (Ex. 7, Fisker at 3:13–26; Ex. 4, Hesselink Decl. ¶ 45.) Tellingly, Fisker also separately refers to "sensor elements," its equivalent to the '711 patent's "image sensor pixels." (*Id.*)

Giving the terms "image pixels" and "image sensor pixels" their appropriate construction renders claim 1 nonsensical and indefinite. If, however, the Court determines that the use of the terms "image pixels" and "image sensor pixels" does not render claim 1 indefinite, for the reasons explained above, Align asks that the Court construe "image pixels" as "pixels on the image that are derived from the image sensor pixels" and "image sensor pixels" as "pixels on the image sensor."

C. "block of the image sensor pixels" / "blocks of image sensor pixels" (asserted claims 1, 9, 42)

Align's Proposed Construction	3Shape's Proposed Construction
"two or more adjacent pixels on the image sensor"	Plain and ordinary meaning

The terms "block of the image sensor pixels" and "blocks of image sensor pixels" appear in claims 1, 9, and 42 of the '711 patent. The terms should be construed as "two or more adjacent pixels on the image sensor," which appropriately and helpfully explains for the jury what a "block" of image sensor pixels is. 3Shape's proposal that the term simply be given its plain and ordinary meaning should be rejected because a construction of the term "block" would be helpful to the jury in understanding the requirements of the claims.

As noted, the "block" term is used in several claims of the patent, including:

> "a data processing system configured to derive surface geometry information for a first set of image pixels within ***a block of the image sensor pixels*** from a series of 2D images recorded by the color image sensor[.]" ('711 patent, 19:53–56 (claim 1) (emphasis added).)
>
> "the data processing system further configured to derive surface color information for a second set of image pixels within ***the block of the images sensor pixels*** from at least one 2D image recorded by the color image sensor…" (*Id.* at 19:57–61 (claim 1) (emphasis added).)
>
> "the data processing system is configured to generate a sub-scan of a part of the object surface based on surface geometry information and surface color information derived from a plurality of ***blocks of image sensor pixels*** which include the ***block of the image sensor pixels***." (*Id.* at 20:21–25 (claim 9) (emphases added).)
>
> "the data processing system is configured to derive the sub-scan color for a point on a generated sub-scan based on the surface color information of 2D images in the series of 2D images in which the correlation measure has its maximum value for the corresponding ***block of the image sensor pixels*** and on at least one additional 2D image." (*Id.* at 21:1–7 (claim 17) (emphasis added).)
>
> "the surface geometry information for a given ***block of the image sensor pixels*** is derived by identifying at which distance from the scanner system the object surface is in focus for that ***block of the image sensor pixels.***" (*Id.* at 23:36–40 (claim 42) (emphases added).)

In each of these instances, a person of ordinary skill in the art would understand that the claim language refers to two or more adjacent pixels on the image sensor. (Ex. 4, Hesselink Decl. ¶ 50.)

That construction is consistent with embodiments of the specification that describe the block as, for example, a group of 6 x 6 adjacent pixels. (*See* '711 patent at 17:10–12 ("This period is represented by a pixel block of 6 by 6 image pixels, and 2 by 2 pattern fields."); Ex. 4, Hesselink Decl. ¶ 51.) That 6 x 6 embodiment is further illustrated in Figures 2A and 2B of the patent, which show "a pixel block of 6 by 6 image pixels" in a 2D array adjacent to one another. Figure 2A represents a picture of a block of the image sensor pixels, while Figure 2B represents a "pixel block of 6 by 6 image pixels." (Ex. 4, Hesselink Decl. ¶ 52.) In both cases, the pixels are adjacent to one another.

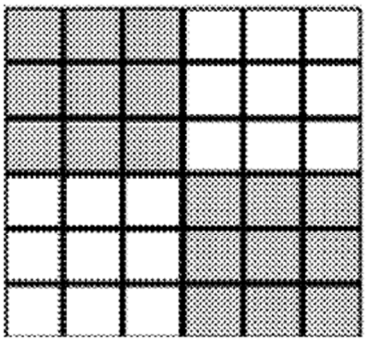

Fig. 2A

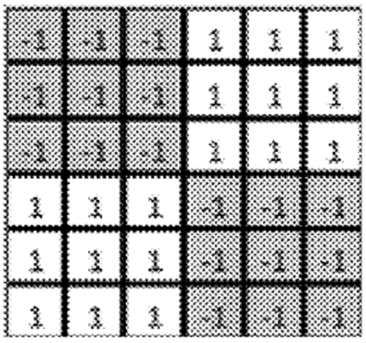

Fig. 2B

Align's proposed construction is further reinforced by extrinsic evidence. For example, the Oxford Dictionary of Computer Science (7th ed. 2016) defines a block as "[a] collection of data units such as words, characters, or records . . . that are stored in *adjacent* physical positions in memory." (Ex. 8 (emphasis added); Ex. 4, Hesselink Decl. ¶ 53.)

Finally, Align's proposed construction is consistent with the construction adopted by the District of Delaware for a nearly identical claim term. In *3Shape v. Align*, 1:18-cv-00886-LPS (D. Del.), 3Shape asserted a patent—U.S. Patent No. 9,962,244—that is within the same family as the

'711 patent and which contains the same specification. The parties disputed the proper construction of the claim term "a block of said image sensor pixels." (Ex. 9, Dkt. No. 176, Report and Recommendation at 15–17.) Following briefing, Magistrate Judge Hall construed the term as "two or more adjacent pixels of said image sensor pixels." *Id.* at 17.[4]

3Shape has not offered a construction of the term "block of the image sensor pixels," contending instead that the term can simply be given its plain and ordinary meaning. But a "block of image sensor pixels" will not have any plain and ordinary meaning to a juror. *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) ("[C]laim construction is a matter of resolution of disputed meanings and technical scope, to clarify and when necessary to explain what the patentee covered by the claims, for use in the determination of infringement.") (citation omitted).

The Court should adopt Align's construction of a "block of image sensor pixels," which is dictated by the intrinsic evidence and supported by extrinsic evidence.

[4] The parties dismissed, without prejudice, all claims and counterclaims related to the '244 patent before District Judge Stark adopted Magistrate Judge Hall's construction of those patent terms. *See* Dkt. No. 323, Memorandum Order at 2, *3Shape v. Align*, 1:18-cv-00886-LPS (D. Del.).

D. "data processing system" terms (asserted claim 1)

Term	Align's Proposed Construction	3Shape's Proposed Construction
"data processing system configured to derive surface geometry information for a first set of image pixels within a block of the image sensor pixels from a series of 2D images recorded by the color image sensor"	Subject to § 112 ¶ 6 Function: "derive surface geometry information for a first set of image pixels within a block" Structure: "a processor programmed to record surface geometry of an object that is derived from at least one of the same 2D images as the surface color information" If not found subject to § 112 ¶ 6, then: "data processing system that derives geometry information for at least one 2D image used to derive color information"	Not subject to § 112 ¶ 6. If not found subject to § 112 ¶ 6 construction: "data processing system configured to derive surface geometry information for a first set of pixels on the image sensor within a block…" If found subject to § 112 ¶ 6 construction: Function: "derive surface geometry information for a first set of pixels on the image sensor within a block…" Structure: "one or more processors, or one or more processors and computer readable medium; and algorithm(s) for deriving surface geometry for a first set of pixels on the image sensor within a block…"

Term	Align's Proposed Construction	3Shape's Proposed Construction
"data processing system further configured to derive surface color information for a second set of image pixels within the block of the image sensor pixels from at least one 2D image recorded by the color image sensor"	Subject to § 112 ¶ 6 Function: "derive surface color information for a second set of image pixels within a block" Structure: "a processor programmed to record color information of an object that is derived from at least one of the same 2D images as the surface geometry information" If not found subject to § 112 ¶ 6, then: "data processing system that derives color information for at least one 2D image used to derive geometry information"	Not subject to § 112 ¶ 6. If not found subject to § 112 ¶ 6 construction: "data processing system configured to derive surface color information for a second set of pixels on the image sensor within a block…" If found subject to § 112 ¶ 6 construction: Function: "derive surface color information for a second set of pixels on the image sensor within the block…" Structure: "one or more processors, or one or more processors and computer readable medium; and algorithm(s) for deriving surface color for a second set of pixels on the image sensor within the block…"

There are two limitations in claim 1 of the '711 patent, each beginning with the phrase "data processing system . . . configured to," that should be construed according to § 112 ¶ 6 because the terms fail to identify a sufficiently definite structure.

Even terms without the word "means" may be construed as means-plus-function terms under § 112 ¶ 6 if the claim term "fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function." *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015) (citation and quotations omitted). Because both "data

processing system" terms recite function without reciting sufficient structure for performing that function, they should be construed according to § 112 ¶ 6.

A person of ordinary skill would view the "data processing system" terms as described in claim 1 of the '711 patent in purely functional terms—"configured to derive [geometry/color] information for a … set of image sensor pixels…." Claim terms that recite a "system" are often understood to recite "nonce" or "functional" words that a person of ordinary skill in the art would use to describe function but not structure. *See Dyfan, LLC v. Target Corp.*, No. W-19-CV-00179-ADA, 2020 WL 8617821, at *8 (W.D. Tex. Nov. 24, 2020) ("Dyfan incorrectly presupposes that 'system' has structure. Rather, 'system' may be a nonce word."). Adding the term "data processing" to "system" does not impart any structure to the term because data processing is itself just a function. *See Williamson*, 792 F.3d at 1350 ("Generic terms such as 'mechanism,' 'element,' 'device,' and other nonce words that reflect nothing more than verbal constructs may be used in a claim in a manner that is tantamount to using the word 'means' because they 'typically do not connote sufficiently definite structure" and therefore may invoke § 112, para. 6.'") (citation omitted). Nothing in the specification or claims of the '711 patent explains or describes what a "data processing system" is beyond describing the functions it is configured to perform.

As means-plus-function terms, the data processing system terms function, respectively, to "derive surface geometry information for a first set of image pixels within a block" and to "derive surface color information for a second set of image pixels within a block." In addition, the structure of the processors in Align's proposed construction track each and every embodiment in the '711 patent, which all disclose a data processing system that "record[s] [geometry/color] information of an object that is derived from at least one of the same 2D images as the surface [color/geometry] information." (*See, e.g.,* '711 patent at 2:37–41 ("a data processing system configured for deriving both surface geometry information and surface color information … at least partly from one 2D

image…"), 3:49–55 ("the data processing system is capable of analyzing a plurality of the 2D images in a series of captured 2D images in order to … derive surface color information from at least one of the 2D images from which the surface geometry information is derived"), 16:63–67 ("a data processing system configured for deriving both surface geometry information and surface color information for a block of pixels of the color image sensor 180 at least partly from one 2D image recorded by the said color image sensor 180.").)

3Shape's proposed construction is much broader than what is permitted by the intrinsic record and lacks support in the specification. Specifically, 3Shape proposes that the structure broadly cover a "processor" and an "algorithm" either "for deriving surface geometry" or "for deriving surface color," depending on which claim term is construed. This construction of the structure of the data processing system claim terms wholly ignores that the only disclosed data processing system derives color information and geometry information at least partly from the same 2D image. *See Aristocrat Techs. Australia Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1331 (Fed. Cir. 2008) (means-plus-function terms are "defined by the structure disclosed in the specification plus any equivalents of that structure"). There is no disclosure in the '711 specification of an algorithm that derives geometry information of an object from completely different images than its derivation of color information. Yet that is expressly included in 3Shape's proposed structure. That is not supported by the specification.

The data processing system claim terms should be subject to § 112 ¶ 6 and construed according to Align's proposal. But in the event the Court determines that the data processing system terms are not subject to § 112 ¶ 6, these terms should be construed as a "data processing system that derives [geometry/color] information for at least one 2D image used to derive [color/geometry] information." This reading is consistent with the intrinsic record. Namely, as explained above, the

'711 specification only discloses use of geometry and color information from at least one of the same 2D images.

E. "low weight" (asserted claim 24)

Align's Proposed Construction	3Shape's Proposed Construction
Indefinite	Plain and ordinary meaning

The term "low weight" appears twice in claim 24 of the '711 patent:

> [T]he error caused by the saturated pixel is mitigated or removed by assigning a ***low weight*** to the surface color information of the saturated pixel in the computer of the smooth sub-scan color and/or by assigning a ***low weight*** to the sub-scan color computed based on the saturated pixel.

('711 patent at 21:35–40 (emphases added).) The term is indefinite because "low" is a term of degree and a person of ordinary skill would not know or understand the bounds of this term.

As explained in Section II.B above, a claim fails for indefiniteness if, when read in light of the specification and the prosecution history, the claim fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention. *Nautilus*, 572 U.S. at 901. Specifically, a claim is indefinite if it can be read to mean different things and "no informed and confident choice is available among the competing definitions." *Id.* at 911 n.8. Without guidance in the specification or prosecution history to inform a person of skill in the art which interpretation is the correct one, the selection of one reading of a claim over another is entirely arbitrary. *See Interval Licensing*, 766 F.3d at 1374 ("The specification offers no indication, thus leaving the skilled artisan to consult the 'unpredictable vagaries of any one person's opinion.'" (citing *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1350 (Fed. Cir. 2005)). A claim with competing interpretations is indefinite because infringement can depend on which definition is used. *See Dow Chem. Co. v. Nova Chems. Corp.* (Canada), 803 F.3d 620, 633–34 (Fed. Cir. 2015) ("Because the methods do not always produce the same results, the method chosen for calculating the slope of strain hardening could affect whether or

not a given product infringes the claims."); *see also Morton Int'l, Inc. v. Cardinal Chem. Co.*, 5 F.3d 1464, 1470 (Fed. Cir. 1993).

A particular circumstance where a claim is indefinite because the terms can be read to mean two different things is with terms of degree, such as "better," "heavier," or "smooth," which are indefinite when the terms of degree "might mean several different things and no informed and confident choice is available among the competing definitions." *Nautilus*, 572 U.S. at 911 n.8; *see also HZNP Medicines LLC v. Actavis Labs. UT, Inc.*, 940 F.3d 680, 698 (Fed. Cir. 2019) (finding "better drying time" indefinite because "[t]wo tests are disclosed, but those tests do not provide consistent results upon which a POSITA would be able to evaluate 'better drying time'"); *Versata Software, Inc. v. Zoho Corp.*, 213 F. Supp. 3d 829, 836 (W.D. Tex. 2016) (finding "space-constrained display" indefinite because "neither the claims themselves nor the prosecution history provide any insight as to the meaning of the term"); *Advanced Display Techs. of Texas, LLC v. AU Optronics Corp.*, No. 6:11-CV-011, 2012 WL 2872121, at *14 (E.D. Tex. July 12, 2012) (finding "smooth bumps" indefinite because specification failed to provide "any objective anchor to determine *how* smooth the bumps must be to facilitate such a function") (emphasis in original). "When a 'word of degree' is used, the court must determine whether the patent provides 'some standard for measuring that degree.'" *Biosig Instruments, Inc. v. Nautilus, Inc.*, 783 F.3d 1374, 1378 (Fed. Cir. 2015) (citing *Enzo Biochem, Inc. v. Applera Corp.*, 599 F.3d 1325, 1332 (Fed. Cir. 2010)).

The use of the relative term "low weight" renders claim 24 indefinite because the intrinsic record—the claim language, the '711 specification, and its prosecution history—fails to inform one of skill in the art, with any reasonable degree of certainty, the boundaries for this term. "Low" is a relative term—low compared to what? Nothing in the claims, the specification, or the prosecution history shed light on what is meant by "low weight." The term is used a handful of times in the '711 specification but never in a manner that defines the bounds of the term. (*See, e.g.* '711 patent at 9:16–

21 ("the error caused by the saturated pixel is mitigated or removed by assigning a low weight to the surface color information…"); 11:59–61 ("Saturated pixel values should preferably have a low weight to reduce the effect of highlights on the recording of the surface color.").) Nor does "low weight" have an ordinarily understood technical meaning in the field. (Ex. 4, Hesselink Decl. ¶ 59.) In fact, a person of ordinary skill in the art would determine, based on the extrinsic evidence, that any weight value could constitute a low weight depending on the circumstances and the context.

Because the patent gives no guidance as to the meaning of "low weight," claim 4 is indefinite.

III. U.S. PATENT NO. 10,905,333

The '333 Patent, entitled "3D intraoral scanner measuring fluorescence," refers to a 3D scanner that uses fluorescent light to detect regions of the teeth that have tooth decay such as caries (cavities) and combines that with a digital 3D picture of the teeth.

Both independent claims (1 and 21) refer in the preambles to a "system configured for displaying a digital representation of a cariogenic region of a tooth and a digital 3D representation of the tooth." The claims discuss a "first light source" that emits light at a "first wavelength" and one or more image sensors that detect light at that wavelength, leading to "data for a 3D surface topography of the tooth." The claims also contain a "second light source" that is "configured to emit light at a second wavelength" and one or more image sensors that detect light at that same wavelength, leading to "data for the cariogenic region of the tooth." A data processor then takes the "data for the 3D topography" and the "data for the cariogenic region" and converts that data into digital representations, which are displayed.

Three claim terms from the '333 patent are in dispute.

A. "cariogenic region of the tooth" (asserted claims 1, 3, 20, 21, 38)

Align's Proposed Construction	3Shape's Proposed Construction
"region of the tooth that the system detects as having tooth decay from emitted fluorescence"	Plain and ordinary meaning

Both independent claims (1 and 21) refer repeatedly to the "cariogenic region of the tooth." The preamble refers to "displaying a digital representation of a cariogenic region of a tooth," the detection of light from the second light source at the second wavelength leads to "data for the cariogenic region of the tooth," and the data processor converts "the data for the cariogenic region" into "the digital representation of the cariogenic region of the tooth." All of these references make it clear that it is the claimed 3D scanner system that is detecting and identifying the "cariogenic region" of the tooth.

"Cariogenic" is a term used in dentistry to refer to "tooth decay." (Ex. 10, Rechmann Decl. ¶ 51; Ex. 11, Merriam Webster's Collegiate Dictionary (11th Ed. 2003) ("Cariogenic—producing or promoting the development of tooth decay.").) A recurring issue in dentistry is how to identify the region of a patient's mouth with tooth decay. For many decades, the determination of whether there was caries disease (the disease leading to cavities) or related forms of tooth decay has been made by practicing dentists, based on visual inspection, review of x-rays, and use of dental instruments. (Ex. 10, Rechmann Decl. ¶ 25.) The x-rays typically display all of the teeth and the dentist determines based in part on the x-rays which teeth, if any, have cavities or tooth decay. (*Id.* ¶ 29.)

But the independent claims (claims 1 or 21) of the '333 patent that refer to the "cariogenic region" do not reference or rely on the actions of a dentist. Instead, independent claims 1 and 21 are system claims—for a "3D scanner system" that among other things displays a cariogenic region of the tooth based on image sensor(s) "detect[ing] light" for which the 3D scanner device "record[s]

data for the cariogenic region of the tooth." In fact, the preambles of claims 1 and 21 both refer to a "3D scanner system for displaying a digital representation of a cariogenic region of a tooth…." A scanner system must first detect a "cariogenic region" in order to display it. (Ex. 10, Rechmann Decl. ¶ 54.) The claimed scanner system in the '333 patent is doing more than simply showing x-ray type images of teeth and asking the dentist to determine whether or not there is tooth decay. Rather, the claims require that the 3D scanner system detect the region that has tooth decay.

The '333 specification explains that detection of the "cariogenic region" by the 3D intraoral scanner system is based on fluorescence emitted from the tooth in response to the emitted light. The Abstract states that the patent is on a system for "detecting and/or visualizing cariogenic regions in teeth"—not providing data so a dental practitioner can do so. ('333 patent at abstract.) The specification is also replete with references to using emitted fluorescence from the teeth to detect cariogenic regions. In the Technical Field section, the specification states that "the invention relates to a 3D scanner system where fluorescence recorded from a patient's teeth is used for detecting cariogenic regions on the teeth." (*Id.* at 1:25–27.) The Summary section further explains that "[i]t is an object of the invention to provide a 3D scanner system which is capable of mapping fluorescence and/or a representation of a cariogenic region onto a digital 3D representation of the teeth." (*Id.* at 2:14–17.) It later refers to "identified cariogenic regions" that "can provide valuable assistance to the dentist when examining a patient's set of teeth." (*Id.* at 2:62–3:1.)

The Federal Circuit has explained that "[w]hen a patentee 'describes the features of the "present invention" as a whole,' he alerts the reader that 'this description limits the scope of the invention.'" *Pacing Techs., LLC v. Garmin Int'l, Inc.*, 778 F.3d 1021, 1025 (Fed. Cir. 2015) (citation omitted); *Verizon Servs. Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1308 (Fed. Cir. 2007) ("When a patent thus describes the features of the 'present invention' as a whole, this description limits the scope of the invention."). Here, the description of the "cariogenic region" as one that is

detected or identified by the 3D scanner system based on fluorescence emitted by the teeth is not merely a preferred embodiment of the invention, but instead is discussed as the central feature of the invention as a whole. As a result, Align's construction of "cariogenic region" should be adopted.

B. "a second light source" (asserted claims 1, 20, 21, 33, 38)

Align's Proposed Construction	**3Shape's Proposed Construction**
"a light source used to excite a fluorescent material of a tooth"	Plain and ordinary meaning

As discussed above, the '333 patent describes the "second light source" of the claims (which, confusingly, is referred to as the first light source in the specification) as a light source used to excite a fluorescent material of a tooth. The reference to use of fluorescence is a central feature of the invention. The '333 patent's specification explains that "an object of the invention" is to use "probe light reflected from the teeth and fluorescence emitted from fluorescent materials of the teeth, such as fluorescent materials in cariogenic regions of a tooth" from the same recorded image. ('333 patent at 2:23–27.) It refers to the probe light (called the "first probe light" in the specification and the "second light source" in the claims) that provides light at a wavelength "which is capable of exciting a fluorescent material of the teeth." (*Id.* at 2:31–34.) The specification further notes that the "3D scanner system according to the present invention" has a "light source that can emit light at a first wavelength [called the "second wavelength" in the claims] intended to excite fluorescence materials in parts of the intraoral cavity." (*Id.* at 3:8–11.)

All of the disclosed embodiments are consistent with this discussion of the light source of the invention. In Figure 1, the "first light source 210 of the illumination unit" is "configured for emitting light at the first wavelength intended to excite fluorescence in the hard tissue parts of the intraoral cavity 300." (*Id.* at 24:35–38.) Figure 2 has a different location in which the first light source is mounted, but is still used for emitting light meant to obtain images of "the fluorescence emitted

from the fluorescent material of the teeth." (*Id.* at 25:66–26:41.) Figure 3 "shows an embodiment of this invention with a single light source configured for both exciting fluorescence and for recording the 3D surface topography." (*Id.* at 26:49–51.)

In short, the discussion of the nature of the invention in the specification and the description of every embodiment is of a light source used to excite a fluorescent material of a tooth. Consistent with this use, the second light source should be interpreted as "a light source used to excite a fluorescent material of a tooth."

C. "the 3D intraoral scanner is configured such that at least one of the one or more image sensor(s) detects light at the second wavelength, thereby configured to record data for the cariogenic region of the tooth" (asserted claims 1, 21)

Align's Proposed Construction	**3Shape's Proposed Construction**
"the 3D intraoral scanner detects and stores data for the cariogenic region of the tooth based on the detection of light by the image sensor(s) at the same wavelength in which light was emitted from the second light source"	Plain and ordinary meaning, which is "the 3D intraoral scanner is configured such that at least one of the one or more image sensor(s) detects light at least at the second wavelength, thereby configured to record data for the cariogenic region of the tooth"

The key point of Align's construction is that in detecting and recording data for the cariogenic region, the independent claims require that the wavelength of the light from the tooth detected by the image sensor is the ***same*** wavelength as the light emitted by the second light source. This construction is required by the clear claim language. Both independent claims 1 and 21 refer to the second light source as configured to "emit light at a second wavelength." They then refer to an image sensor that "detects light at the second wavelength." The claim limitation then requires that the 3D scanner device is "thereby configured to record data for the cariogenic region of the tooth." Because the light emitted from the second light source and the light detected by the image sensor are both at the "second wavelength," the proper construction is that they are the same wavelength.

By contrast, 3Shape's proposed construction requires only that the 3D scanner detect light "at least at the second wavelength." That construction seeks to evade that the "data for the cariogenic region" is based on the detection of light at the "second wavelength," which is the same second wavelength at which light was emitted from the second light source pursuant to an earlier part of the claim limitation. The claim limitation does not simply require that an image sensor detect light at a number of wavelengths, one of which is the same as the wavelength emitted by the second light source. Rather, the last clause refers to "thereby configured to record data for the cariogenic region of the tooth," which requires that it is the detection of light at that same second wavelength that leads to the recording of data. 3Shape's proposed construction inappropriately reads out the "thereby" clause that creates the tie between the detection of light at the second wavelength and the recording of data. As a result, Align's proposed construction should be adopted.

CONCLUSION

Align respectfully requests that the Court adopt its claim constructions.

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and correct copy of the above and foregoing document has been served on all counsel of record via email.

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